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## ABSTRACT

Space perception is necessary for work in branches of technology from the machine industry to civil, electrical, and material engineering. The spatial perception of students coming to technical universities is not highly developed. There are several reasons for this unfortunate situation: firstly, the lack of emphasis put on geometry and other subjects developing this kind of perception; and secondly, the perception of our life as flat such as viewed on television. At primary and secondary schools it is essential to support subjects enabling one to "experience" space, mainly geometry, graphic, and plastic art education, technology education, geography, etc. As for teaching geometry, it is necessary to renew its importance, firstly by better using present curricula (teacher's approach, using models, etc), and secondly by reintroducing geometry at schools where it has been abandoned. Visualizing three-dimensional objects and functions by a computer (rendering) is the latest highly effective method. The concept of the third dimension is met when working with a map in geography as well as in everyday life. The new method (Comparative Geography) is using a mountain altitude measure based on its comparison with a referential mountain. Its objective character, easy memorizability, comparability, and possibility of making altitude scales contribute to better and more frequent perception of the third dimension in the countryside. In arts and crafts, three-dimensional objects are used both directly (clay, wood, metal) and indirectly as when they are transferred to two-dimensional ones when drawing (perspective, contrast of light, color contrast). These disciplines have also been negatively affected by reducing their extent and decreasing their importance. Learners can acquire space perception better if a multi-disciplinary approach is used in education involving disciplines like art and emotional education. In this way, space perception can be enriched with a human dimension that influences not only a teenage learner's cognitive processes but also volitional acts. This principle, applied in some alternative schools, is used very little in the traditional educational system. Nevertheless, it is a developed way of applying an old J. A. Komensky principle: "We should perceive by senses as much as possible." (Author/SAH)

# Some Ways of Acquiring Space Perception

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**Abstract:** Space perception is necessary for work in branches of technology, from machine industry and civil, electrical and material engineering to mining and metallurgy. The space perception of students coming to technical universities is not highly developed. There are several reasons for this unfortunate situation; firstly, the lack of emphasis put on geometry and other subjects developing this kind of perception, secondly, making perceiving and our life nowadays flat (TV screen).

At primary and secondary schools it is essential to support subjects enabling one to "experience" space, mainly geometry, graphic and plastic art education, technology education, geography, etc.

As for teaching geometry, it is necessary to renew its importance; firstly by better using present curricula (teacher's approach, using models, etc.), secondly, by reintroducing geometry at schools where it has been abandoned.

Visualizing three-dimensional objects and functions by a computer (rendering) is a highly effective latest method.

We meet the concept of the third dimension when working with a map in geography as well as in everyday life. The new method (comparative geography) is using a mountain altitude measure based on its comparison with a referential mountain. Its objective character, easy memorizability, comparability and possibility of making altitude scales contribute to better and more frequent perception of the third dimension in the countryside.

In arts and crafts three-dimensional objects are used both directly (clay, wood, metal) and indirectly; when they are transferred to two-dimensional ones when drawing (perspective, contrast of light, colour contrast). These disciplines have also been negatively affected by reducing their extent and decreasing their importance.

Learners can acquire space perception better if a multi-disciplinary approach is used in education, involving disciplines like art and emotional education. In this way space perception can be enriched with a human dimension that influences not only a teenage learner's cognitive processes but also volitional acts. This principle applied in some alternative schools is used very little in our traditional educational system. Nevertheless, it is a developed way of applying an old J. A. Komensky's principle: "We should perceive by senses as much as possible".

**Keywords:** space, imagination, creativity, geometry, altitude

## 1 Introduction

The need of acquiring and developing space perception and imagination in engineering education is very urgent. It is necessary to begin from childhood and to use all possibilities even in the sense of an old J. A. Komensky's principle "We should perceive by senses as much as possible" [1].

In the article we present we tried to deal with problem from the point of view of a fine arts teacher and a descriptive geometry teacher. Besides, we tried to indicate further possible new ways.

## 2 Reasons for and manners of looking for ways to space imagination - the view of the fine arts teacher

Considering the fact that man at the end of this millennium is looking for ways to space imagination, we can't resist asking some questions. How do we understand the issue of space perception in relation to a human being? How does space imagination as a human ability influences a human life? Looking for ways to space imagination, then we admit the limitation of this sense. It is necessary to ask why this problem becomes visible just nowadays. How is it connected with the development of society, with scientific and technical development, with arts, education and upbringing?

These questions are undoubtedly very difficult to answer, not speaking about exhausting answers. It seems that it may be one of the principal problems in the present less comprehensible existential discourse.

Let's try realizing the fact how a life of man, or rather his physical existence is limited by a time-space dimension. The man physically moves in space and perceives it by his developed sense organs. Natural environment determines his physical existence. Decomposition, disintegration of an organic matter makes him depressed, fills him with doubts, confronts him with decay, an ecological apocalypse, the danger of death.

At the same time people exist in spacelessness when using their spiritual and mental abilities. It is mainly the ability to think that is in a present man fully in his consciousness. A man can consciously control his thinking, he may for example think about it, etc. Thinking in an adult is the most developed ability, both from the phylogenetic and ontogenetic point of view. Thinking is conditioned by sensory abilities. As people we are able to employ our developed senses, sight, touch, hearing, taste, smell as well as the sense of perceiving temperature when perceiving and recognizing the sensory world, that is the world of shapes, forms, materials of various character and qualities, the space world. A man who lives emotionally and who is able to experience the material world of the first and second nature by senses, in other words a man with the ability to experience the material reality of the world through space is able to recall such an experience in his imaginations and is able to imagine it in spacelessness, in his thinking. The ability of imagination when experiencing space on the basis of previous perceptual experience, which is the ability of one's own unique free reflection of the world we live in is a condition for the development of other human mental abilities, mainly the ability to think.

This deduction seems to be logical and clear. Let's ask another question. Why are we looking for ways to space imagination? Is it because we seem to be losing this ability? It may be true that sometimes our thinking and our will and activities it is connected with come to a crisis when we are being on the way to ecological, economic, ethnic and other disasters. If we want to find, mainly for teaching practice, the way to space imagination, we should probably realize first why we are losing real abilities of imaginations in situations of meetings.

Meeting the countryside, landscape, life, other people -- I think that video media are the main factor responsible for the loss of our authentic experience resulting from one's own perceptual experience.

A TV screen takes our space imagination every day. A TV screen represents the escape to spacelessness, the escape from reality. A TV screen presents, mediates to a TV viewer a somebody else's idea, for example the idea of a director or an actor, the idea of someone who has made his own idea on the basis of his own sensory experiences and presents his opinion, his thoughts, his emotions and his will by doing. He presents us his story. However, such a story may be absurd, nonsensical and also inhumane to a fairly large extent, which is something this medium makes possible. In such a way we may be manipulated, sometimes not even fully aware of it. Unfortunately, young people are most prone to this intentional escape from reality. If we confront ourselves with any marginal and life-threatening situation on TV, we cannot experience it authentically, we cannot feel pain, weight, fear, we cannot experience danger on our own skin. Consequently, we cannot get an idea of space of the situation, and so we participate in it by neither our own emotions nor thoughts. We often identify ourselves with actors without being able to influence their behaviour and acts. We are forced thinking and doing and this can reversibly influence our experiences and abilities to reflect on life. This can lead to the loss of space imagination. As a result, children look at life from the superman's point of view - and this may happen only in less serious cases.

I assess this problem from the position of the teacher of fine arts. It is necessary to realize the fact that fine art is not only a visual art. Only virtual space is mediated just through the visual channel. The fine arts and art lessons are means of knowledge, understanding and creation of the space world. Fine art activities as well as all other pedagogic activities, except videomedia ones, lead to the development of space imagination and creativity by means of direct experience activities in the material world. Creative activities with a mass, with various materials and activities in the countryside develop sensory sensitivity, space imagination, and the ability of empathy and thinking. This is the only way for man to save his ability to make human decisions and to behave adequately.

### 3 The development of imaginative powers and space perception at primary and secondary schools

It is necessary for the development of imaginative powers and space perception at primary and secondary schools to follow up with the work at kindergartens, or rather upbringing in the family. In some areas this is enabled by all natural disciplines.

A really erudite pedagogue uses models and visual aids naturally and when appropriate, and what is enormously important, s/he shows their pupils and students the way of making the graphic record of such objects and situations and vice versa.

In the current technical world, in days when using computers is more and more widespread, it is important not to forget the issues of the development of perception of surrounding space. To a high degree it is advisable to renew the importance of geometry, the part of mathematics.

The study of geometry enables not only the development of imagination but also the development of logical thinking, the development of carefulness and accuracy when expressing anything in a graphic way. All these aspects are important for studies at technical colleges and universities and for the following professional life to such an extent that we should not definitely neglect them.

## 4 New ways of acquiring and developing space imagination

Currently, the analysis of the need of space imagination acquisition and the analysis of the causes of its losing also develops a need of making use of all available ways, known as well as new ones.

### 4.1 Comparative orography – mountain altitude measure

Geography is the best natural discipline that enables "experiencing" space from many points of view. We meet the third dimension – altitude – when studying the countryside, working with a map not only at schools but also in everyday life when we are adults.

On commonly available physical maps the altitude is distinguished by colour and marked by quotas. Incomparability is a disadvantage of coloured scales; they differ from one another on maps of different regions or on maps by different authors. The scope of particular altitude levels is also different.

There is a number of disadvantages of marking the height of mountains in metres above sea-level. It is not illustrative, it is difficult to remember, etc. One area of comparative orography[2] is the application of the mountain altitude measure based on its comparison with a referential mountain.

This way allows a significant simplification of numeral expressions, reduction of the number of numerals to one to two out of three to four. There are only two continents on which the highest mountains exceed the value of 10, consequently for everyday life the number rounded to one decimal place should be sufficient. The benefit of this simplification is an easy memorizability, resulting both from the memorizing process in itself as well as from its psychology.

Furthermore, another benefit is a comparability, which is made practically impossible by more-figured numbers, and the possibility of making altitude scales in particular regions (the so-called pedagogical games).

Besides all the benefits mentioned above, the visual character of perceiving the third dimension in the countryside enabled by its comparison with a known particular referential mountain is the contribution of the mountain altitude measure to the acquisition and development of space imagination.

### 4.2 Visualizing of three – dimensional objects and functions by computer

Visualizing three-dimensional objects and functions by a computer (rendering) is a developing teaching method at technical colleges and universities [3]. The problem is the nature of presentation on the screen, the issue discussed in the chapter on the process of acquiring space imagination.

As advantages may be regarded the possibility of simultaneous presentation of three points of view as well as quick changes of the point of view. Furthermore, there is a still-developing range of other possibilities. Their suitable choice together with the usage of appropriate teaching aids may contribute to the development of space imagination [4].

## 5 Conclusions

The of space imagination for the development of human mental abilities analysed from the point of view of the fine arts teacher shows that an optimal way to the acquisition and development of space imagination are graphic and plastic activities. An adequate approach to teaching geometry, a creative discipline, the prestige of which we should renew, including its due extent, and a new more illustrative use of the third dimension (altitude) when working with a map are beneficial as well.

At the same time the analysis of the causes of losing space imagination these days also raises the question of the need of using all other available ways of its acquiring. Among others, it is visualizing three-dimensional objects by a computer. It is undoubtedly the point of the discussion in terms of education at technical colleges and universities.

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